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THE LAKE STATES
FOREST EXPERIMENT STATION

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RESEARCH - BASIS OF SOUND PRACTICE

The test of research is its application to the improvement of forest practice. The purpose of the Experiment Station is not fulfilled merely by publishing the results of its investigations. Unless the results find their way into every day work on the forest, the work is only half completed.

The aim of the Forest Research Digest is to bring to the attention of every field administrative officer possible improvements in the technical forest work, to acquaint them with the results of the Experiment Station's investigations and to build up a close and intimate understanding between those charged with administrative duties and those who are responsible for finding improved methods for performing those duties. It is also to serve as a means of keeping the research men regularly in touch with the most recent developments in their field.

POLICY FOR DEVELOPMENT OF EXPERIMENTAL FORESTS AND RANGES

The Branch of Research has formulated a definite policy to be followed in the development of all experimental areas. This policy has the approval of the Forester.

Roads

On experimental forests it will be the aim to develop a complete utilization road system which will make it easily possible to take out at any time and from any part of the forest even very small quantities of timber which should be cut either for research purposes or as a phase of the management of the experimental forest. The system of roads should give an absolute grip on both research installations and management cuttings. Complete plans should be perfected so that the fullest possible advantage may be taken of any funds that become available.

It may be necessary to develop new road standards to meet these requirements as the Forest Service has not constructed utilization roads in the national forests to any great extent.

Protection

Protection requirements will be met by construction of additional roads and trails, firebreaks, special look-out towers, cleaning up of dangerous slash areas, snags, acquiring special fire equipment such as pumps and where necessary, tanks, etc. Plans should be formulated for the intensive protection justified by large investments in research. These plans should be carried out as rapidly as funds permit.

Surveys

Complete surveys including estimates, maps, etc. should be made as a basis for road, management and protection plans. These surveys made with emergency funds should lean toward being too intensive rather than not sufficiently detailed.

Natural Areas

Natural areas which constitute a part of experimental forests or ranges should be provided for as a phase of the plans for the larger areas. Where such areas are not a part of larger experimental areas, special provision may be necessary for protection over and above that in regular national forest administration.

Headquarters on Experimental Forests and Ranges

(1) Location. This should take fully into account convenience and requirements for research and administration of the experimental area. It should also take fully into account the scenic beauty of the setting. Where the headquarters can be placed in a beautiful setting and still meet the requirements for research and administration, it should be done.

(2) The development of long-time plans which will take into account present and as fully as possible, future needs. These plans should cover buildings as to number, design, location, etc.; the development of the grounds including approaches to the headquarters; the development of water supplies, electricity, and other forms of services. Only by a general plan of this sort are we likely to get unified, harmonious and thoroughly satisfactory treatment.

In general, the policy will be to put all experimental areas into the best possible shape for carrying out the research work that will be done on them. The future of the experimental work must not be handicapped by inadequate facilities, and if further opportunities for developing these areas are presented, the fullest possible advantage should be taken of them.

EFFECT OF RAKING LITTER

The results of a study of the chemical changes that are brought about by continued raking of the leaf litter in a pine stand have been made available in English by the Branch of Research.

The chemical composition of the soil, the needles and the wood from a raked and an unraked plot were compared. The litter and humus cover on the unraked area was only about three-quarters of an inch thick. The raked plot was kept clear of all litter and humus by repeated rakings.

The original chemical composition of the two soils were similar but the constant raking has resulted in marked decreases in degree of acidity, the percentage of organic compounds, and lime content. There was an extensive loss of nitrogen in the surface layer of the raked plot, but this was balanced in the deeper horizons.

The phosphoric acid content of the raked area is deficient, but increases with increasing depth, whereas on the unraked area phosphorous percentage decreases with depth. The washing action of percolation carries the soluble soil nutrients from the bare surfaces of the raked plot to the lower soil horizons.

When samples of needles were analyzed for organic substances, it was found that the trees on the raked plots showed a higher percentage of resins and less cellulose. Samples of the wood demonstrated the same differences, higher resinoid content, higher lignin content, but less cellulose in the wood from the raked plot. The practical effect of these differences is seen in the greater decay resistance of wood from raked stands.

(The Raking of Litter and its Effect upon the Chemical Composition of the Soil, of the Needles, and of the Wood of a Pine Stand), by Antonin Nemecek, from *Allgemeine Forst und Jagdzeitung*, Jahrgang 109, July 1933, pages 214-219. Translated from the German by Albin Meier, August 1934.

PAST HISTORY OF SHELTERBELTS

The past history of shelterbelt planting in the plains and prairie region presents some facts of interest in connection with the present Shelterbelt project.

The first Arbor Day was celebrated in Nebraska in 1872. Its purpose was to urge upon the people the vital importance of tree planting. According to the records, millions of trees were planted on that day. Small trees which grew naturally in great abundance on the sandbars and along the banks of the streams and rivers were dug up and planted in groves along the fire guards about each settler's claim. Most the trees planted were cottonwood. In 1874 a resolution was passed providing for an Arbor Day in Nebraska every year.

It is also interesting to recall that the first field activities of the Forest Service centered in Kansas and Nebraska.

Another interesting fact is the acreage which has already been planted within the proposed forest protective zone. The best available figure is the total planted up to 1909. The figures follow:

South Dakota	-	120,000	acres
Nebraska	-	192,000	"
Kansas	-	175,000	"
Oklahoma	-	21,000	"
Texas	-	13,000	"

In North Dakota, according to our own estimates of two years ago, there must be some 75,000 acres in shelterbelts. Using these figures, the total is 596,000 acres. Allowing for the plantations put in since 1909, the present total is probably in the neighborhood of 1,000,000 acres.

Reports from the field indicate that most of the shelterbelts came through the drought exceptionally well, although some species in the plantations were entirely wiped out. This is particularly true of such species as jack pine and red pine, which should not have been planted there in the first place.

RELATIONSHIP BETWEEN MARSH WATER LEVELS AND LAKE LEVELS

G. L. Lincoln, writing from the University of Wisconsin in the October 5th issue of "Science", proposes a new theory to explain the extreme rate of recession of lakes that has taken place during the last eight years. He states that while a gradual recession has been taking place over a period of 32 years, the fall during the last eight years has reached an alarming stage. Nearly 60% of the total recession appears to have occurred in this latter period.

The usual belief is that marsh levels are dependent upon the levels of adjacent bodies of water and streams. Observations plus a few calculations tend to show that exactly the opposite relation is probably nearer the truth.

During the 32 years of gradual recession of lake levels, the water in adjoining swamps declined at about the same rate. Around 1926 the swamps began to freeze over without surface water on them. Calculations show that when spring comes a great deal less energy would be required to thaw out the dry frozen marsh than the typical wet one. Since the total heat available each spring remains more or less constant, it would seem that the dry marsh would thaw out much earlier than a wet one.

If the dry marsh thaws first, it seems probable that the precipitation will be allowed to seep vertically through the marsh into the deep water tables below. The wet frozen marsh, on the other hand, acts as a very effective barrier to vertical drainage and forces the water laterally into the higher water tables, to stagnant pools and finally into the brooks and streams that are tributary to the lakes.

The author states that this theory as presented does not allow for other numerous variables that would enter into the problem, but he believes that further detailed field study would reveal a high correlation between decreasing thaw periods for marshes and decreasing lake levels. It could also be demonstrated that the thaw period of a marsh is largely dependent upon the water content of the soil and the depth of surface water.

The implications of this theory are that if the marshes can be made to retain enough water over the summer months, it seems plausible that surface drainage could be restored. It clearly indicates that it is fully as important to confine water on the surface of marshes as it is to retain water in lakes by means of dams. It is also a cogent argument against the very questionable practice of swamp drainage.

GIFFORD PINCHOT RETURNS TO WASHINGTON

Former Forester Gifford Pinchot writes that with the expiration of his term as Governor of Pennsylvania, he will spend the winter in Washington where he expects once more to take an interest in forestry affairs. He is enthusiastic over the prospect of working for the cause of forestry with a leader like Silcox.

SIMPLIFIED TYPE SCHEME FOR FOREST SURVEYS

Two difficulties are encountered in using any type scheme based entirely upon composition of the present forest cover in an undertaking such as the National Timber Survey which covers a large geographical area.

In the first place, the very complexity of the present cover where the land has been recently cut, burned, or otherwise disturbed, leads to such an extended list of types that a simple summarization and presentation of a regional or national picture is out of the question. The broad outlines of the forest situation are lost in a maze of details. Even the types in the Society of American Foresters' scheme, which fall far short of exhausting the possible cover conditions, include rather an imposing list.

Secondly, in a great many cases, the statement of the present cover gives, if not an erroneous, at least a very inadequate picture of the situation. Take for instance, the aspen type in the Lake States, a more or less temporary type which occupies some 20 million acres of cut-over and burned land. The conditions within this type are strikingly different. Where aspen has come in on hardwood land following fire, it usually makes a pretty fair tree, valuable for pulpwood and even sawlogs. On sandy pine land, on the other hand, it is practically worthless as a timber tree. On spruce land, it is commonly understocked with balsam and is in process of natural conversion to the original type. On hardwood land, the natural development is toward mixed hardwood forest of maple, basswood, etc. On pine land, the understory, if any, is white, Norway, or jack pine. Thus to characterize an area merely as aspen type obscures not only the immediate commercial value of the area but also the long run worth and possibilities of the land.

To overcome these difficulties in the Forest Survey in the Lake States, a simple classification of the "land type" has been superimposed upon the cover type classification. Six "land types" have been used here to indicate the environment or natural forest conditions rather than present cover. These land types are:

- Pine land
- Hardwood land
- Spruce fir land
- Coniferous swamp
- Hardwood swamp
- Open land

This classification of "land type" gives a definite clue to the sites on which the present cover is growing, the probable direction of natural succession, and, at the same time, serves as a natural grouping for a great assortment of insignificant types which mean little or nothing in the natural picture.

LAND UTILIZATION IN MINNESOTA - A STATE PROGRAM FOR THE CUT-OVER LANDS

A report of 289 pages containing many maps and charts is just off the press of the University of Minnesota. This report has been prepared by a committee appointed by the Governor in 1932. Lotus D. Coffman, President of the University, was the chairman. The appointment of this Committee was urged by the Experiment Station which prepared a great deal of the material and edited the final manuscript. The recommendations of the committee lay the foundation for a State and Federal acquisition policy and for this reason should be of interest to all State and Federal Forest Service men in the region.

The recommendations of the Committee are briefly these:

The formation of permanent State and County Land Use committees with the State Committee being given the first and controlling voice in land classification; the systematic classification of all land in the cut-over counties by the Land Use Committees; the adoption of zoning ordinances for the purpose of enforcing regulations concerning land use; the amendment of the present law so that the State will be given absolute title to land reverting through tax delinquency; the settlement with local units of government for their equities in tax-delinquent lands on terms fair to both State and local governments; acquisition for forestry purposes of additional land sufficient to bring the total acreage in State forests to approximately 5,000,000 acres of suitable land; forest management for all forests established by State or local units according to the best methods possible, and several others of less interest from the standpoint of forestry.

Two of the many maps are of especial interest to Forest Service men: one, a map showing the division of the northern part of the State into zones: agriculture, forestry, mining, recreation, etc; the other showing the area which will eventually be in public forests and its subdivision into National and State forests.

THE PRESENT SET-UP OF EXPERIMENT STATIONS REMAINS UNCHANGED

The question of placing the supervision of the Experiment Stations under the Regional Foresters has been debated for some time. The Forester, after a very careful consideration of the advantages of the present and suggested forms of organization, decided to continue the present set-up, because by so doing he believes the Forest Service can make the greatest progress and render the greatest public service.

Without in any way impairing the independence of thought necessary for progress, there are undoubtedly ways in which the working relationships between administration and research can be made more effective. This calls for continued thought and effort by Regional Foresters, Experiment Station Directors, and by the Branches in Washington.

MORNING VERSUS EVENING DEER COUNTS

The recent experience of members of the Biological Survey in making counts of deer on the Chippewa and Superior National Forests, discloses some very definite facts in regard to the time of day when roadside observations should be made. These roadside deer counts are made not for the purpose of determining the number of deer in a given area, but to act as a measuring stick for estimating the trends of deer population from year to year.

The method followed in making these roadside counts is to drive over the same circuit once a day for a number of successive days. At first it was thought that the best time to make the trip was the two hours before dark in the evening. However, when the number of deer seen and the number of cases of interference from other cars on the evening trips is compared with these observations on a morning trip, the advisability of making the counts during the first two hours of daylight is very apparent.

On the Chippewa National Forest, two trips were made daily over the same route, a circuit of 19.2 miles. One trip was made during the first two hours of daylight, and another in the evening before darkness. A record of deer seen and the number of other automobiles passed on the road was kept. Twice as many deer were seen on the morning trips as on the evening, and in addition there were only two mornings out of the ten when other cars were seen, whereas in the evening no trips were made without interference of from one to four cars. On the Superior National Forest the experience was the same, twice as many deer were seen in the morning, and car interference on four mornings out of nine as compared with interference on every night trip. These figures plainly demonstrate the advantages of making such deer counts during the first two hours of daylight.

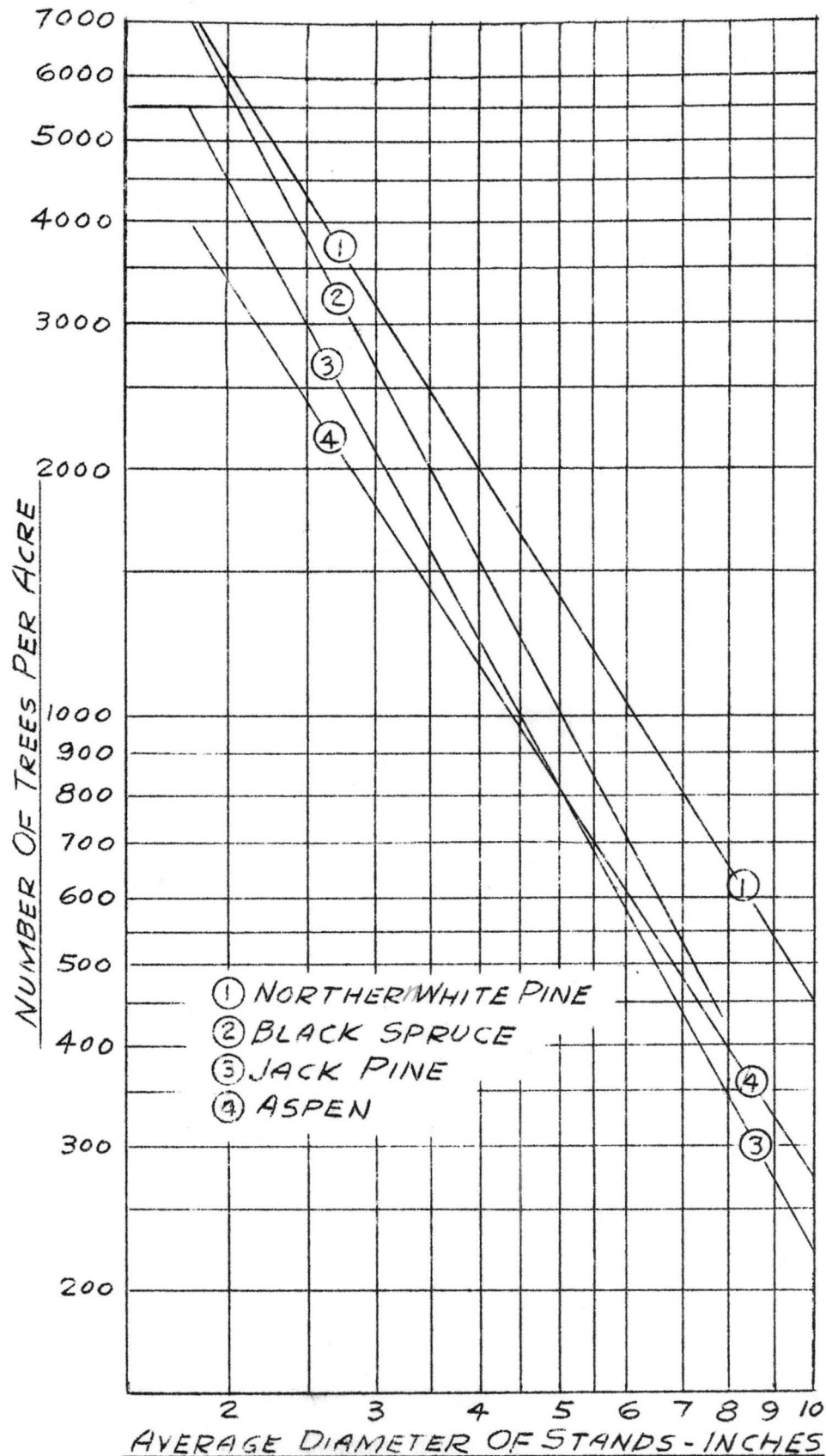
A GUIDE FOR DETERMINING THE DENSITY OF STOCKING IN EVEN-AGED STANDS

Determination of the density of stocking without knowing basal area, age, or site, is made possible through use of the accompanying chart. This chart shows the relationship between the number of trees per acre and the average stand diameter for even-aged fully stocked stands of northern white pine, black spruce, jack pine, and aspen. The density of stocking is determined by comparing the number of trees per acre in the stand in question with the number shown in the chart for a stand of the corresponding average diameter, the chart values being taken as standard for normally stocked even-aged stands.

For example, suppose it is desired to determine the density of stocking of a jack pine stand having 500 trees per acre and an average diameter of $4\frac{1}{2}$ inches. By reference to the graph it can be seen that a fully stocked jack pine stand should have 1,000 trees per acre when it has an average diameter of $4\frac{1}{2}$ inches. Therefore, the stand under consideration is 50 percent stocked.

FIGURE-1.

THE RELATIONSHIP BETWEEN NUMBER OF TREES PER ACRE AND THE AVERAGE STAND DIAMETER
EVEN AGED FULLY STOCKED STANDS



RELEASE OF YOUNG NORWAY PINE FROM ASPEN COMPETITION

The C.C.C. Camps have made a large number of release cuttings in Northern Minnesota. What is the value of such cuttings, and what effects may be expected as a result of them?

One answer to these questions is found in the results of release cuttings in the Birch Lake Norway pine plantation on the Superior National Forest. This plantation was established in 1915. A fire which burned off all vegetation had occurred the previous year. The plantation is a little over a hundred acres in extent. Various ages of stock were used but all were transplants, 2-1, 1-1, and 1-2. The trees were spaced 8 x 8 feet or 680 trees to the acre. After planting no care was given the area.

In 1931 the station made an examination of the area and found that although pine still predominated on one-fifth of the area, aspen and brush had completely claimed one-fourth of the plantation and over half was a mixture of aspen and pine.

In the same year a release cutting experiment was established in the area of mixed aspen and pine, where aspen suckers to the extent of 1400 per acre had grown up and due to their large size were affording considerable competition to the planted pines. At this time there were about 375 Norway pines per acre, which ranged in diameter from 1 to 5 inches and in height from 9 to 28 feet. On one quarter-acre 380 aspen per acre were cut and only the thriftier pines were released. On another quarter-acre every planted tree was released, necessitating the cutting of 800 aspen per acre. A third plot was left uncut for comparison.

In 1934, or three years later, the plots were remeasured to determine the effect of the removal of the aspen competition. The diameter growth in the heavily released plot was .31 inches per year, nearly two and a half times as great as on the check plot, .13 inches per year, and nearly one and a half times as great as on the lightly treated plot, .23 inches per year. The trees which were suppressed at the time of cutting on the heavy release plot responded so well that they grew in diameter almost as fast as the dominant trees. The height growth was similarly affected but to a lesser degree than the diameter growth.

The heavy release cutting is by far the most effective, both as regards the growth of each individual pine and freedom from future aspen competition. In the moderately released plot some pines are still suppressed and will probably die within a few years.

BRANCH STATIONS OF THE LAKE STATES FOREST EXPERIMENT STATION

The Lake States Forest Experiment Station, aside from its headquarters at University Farm, St. Paul, maintains seven field stations, most of which have experimental forests attached to them.

1. The Upper Peninsula Experimental Forest at Dukes, 22 miles east of Marquette, Michigan. The work at this Station is confined largely to work in the management of northern hardwoods.
2. The Forest Fire Research Station near Roscommon, Michigan. This field station maintained in cooperation with the Michigan Conservation Department is devoted primarily to problems of forest fire protection, detection, and prevention.
3. The Huron Planting Station on the Huron National Forest in Michigan. The work here is confined to planting problems.
4. The Kawishiwi Experimental Forest at the Half-Way Ranger Station on the Superior National Forest. This Station includes the study of problems of forest management in jack pine, spruce and aspen stands, and also planting and aspen conversion.
5. The Pike Bay and Cut-Foot Experimental areas on the Chippewa National Forest. A wide range of experiments have been conducted in conversion of aspen and brush land to coniferous stands, methods of cutting, thinning, swamp drainage, source of seed, etc.
6. The Northern Plains Station near Towner, North Dakota. This station is devoted largely to planting in the sandhills of North Dakota.
7. The Soil Erosion Station at LaCrosse, Wisconsin. The work here is concerned with the control of erosion and the measurement of various factors such as run-off, percolation, etc. that are connected with erosion.